JIKM. 2025; 17(3): 155-162
DOI: 10.52022/jikm.v17i3.784
p-ISSN: 2085-4366, e-ISSN: 2684-950X

Jurnal Ilmiah Kesehatan Masyarakat
Media Komunikasi Komunitas Kesehatan Masyarakat

Relationship between Nutritional Knowledge, Vegetable and Fruit Consumption Behavior, and Nutritional Status of Students at Bhayangkara University, Bekasi

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Abstract

Background*: In Indonesia, nutritional issues in adulthood remain prevalent, with university students representing an important transitional stage into this life period. Nutritional status is influenced by several factors, among which food intake plays a central role. Nutritional knowledge is another key determinant, as it shapes individual behavior in food selection. Adequate intake of dietary fiber, primarily derived from fruits and vegetables, is essential in adulthood for maintaining overall health. This study aimed to analyze the relationship between nutritional knowledge, vegetable and fruit consumption behavior, and nutritional status of students at Bhayangkara University, Bekasi.*

Methods: *This study used a cross-sectional design. A total of 61 students of the Faculty of Communication Sciences, Bhayangkara University, Bekasi, who were 19—22 years old, participated as samples. Samples were recruited using a consecutive sampling technique. Data collection comprised three components: nutritional knowledge of fruits and vegetables, measured using a structured questionnaire; consumption behavior, assessed through the Food Frequency Questionnaire (FFQ); and nutritional status, determined using body mass index (BMI). Data were analyzed using the Chi-Square test.*

Results*: The results showed no significant relationship between nutritional knowledge and nutritional status (p-value = 0.153). However, a significant relationship was observed between vegetable and fruit consumption and nutritional status of students (p-value = 0.011.*

Conclusion*: While nutritional knowledge was not directly associated with students' nutritional status, consumption behavior of fruits and vegetables was significantly related to nutritional outcomes among students at Bhayangkara University, Bekasi.*

Keywords*: Fruit consumption, Nutritional knowledge, Nutritional status, Vegetable consumption*

INTRODUCTION

University students are individuals enrolled in higher education institutions who have met the respective admission requirements. Typically, they fall within the age range of 19—22 years, representing a transitional period into adulthood. This stage corresponds to the young adult category, considered the initial phase of adult development. According to the Ministry of Health of the Republic of Indonesia in 2017, individuals aged 19—29 years old are classified as young adults.[1]

In Indonesia, there are still many problems with nutritional status in adulthood. Nutritional status refers to the condition of the body that describes the intake of food and nutrients that function in providing energy, supporting growth, development, tissue repair, and regulating body metabolism.[2] According to the 2018 National Basic Health Research report, the prevalence of underweight among 19-year-olds was 20.7%, while 15.5% were classified as overweight. Among individuals aged 20–24 years, the prevalence of underweight was 15.8% and overweight was 20.5%.[3] Furthermore, monitoring data on nutritional status in West Java Province in 2017 reported that among adults over 18 years, 5.7% were underweight, 14.4% were overweight, and 30.7% were obese.[4]

The main factors that directly affect nutritional status are food intake and infection. Another factor is consumption patterns. Students, like other communities or households, are also involved in daily economic activities, including food consumption.[5] Inappropriate food choices often lead to

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Received: April 7, 2025
Accepted: August 11, 2025
Published: August 26, 2025

abnormalities in nutritional status. On the other hand, consumption of low-fat and high-fiber foods in adulthood is essential for their health, especially considering the hectic activity schedule in adulthood.[6]

Research conducted by Nenobanu et al at Satya Wacana Christian University found that 66% of total respondents had low levels of fruit and vegetable consumption.[7] According to the 2018 Basic Health Research report, the percentage of low fruit and vegetable consumption among adults was 96.9%. In West Java province, the prevalence was 98.1% in 2018.[3]

In addition to dietary patterns, there are also other factors that affect nutritional status, such as nutritional knowledge. Food consumption in a person can be influenced by nutrition-related knowledge. Ignorance about nutrition can lead to irregular eating habits and behaviors, which in turn can lead to nutritional problems. Nutritional knowledge encompasses an understanding of how to select and consume food appropriately to meet the body's essential nutrients requirements for normal functioning.[8] Consequently, an individual's nutritional knowledge plays a critical role in shaping food choice behaviors, which in turn affects their nutritional status.

Bhayangkara University students include non-health majors, referring to those enrolled in study programs outside the health sciences. A preliminary study conducted among 15 students at Bhayangkara University, Bekasi, using Google Forms showed that 75% of respondents consumed fruit fewer than twice per day and vegetables fewer than three times per day. These findings suggest that fruit and vegetable intake among university students remains inadequate. Most students reside either in boarding houses or with their parents. However, those living in boarding houses tend to consume vegetables and fruits less frequently and often rely on less healthy food options. This pattern is influenced by various factors, including busy schedules, limited awareness, and insufficient knowledge of healthy eating, which may contribute to the development of nutritional problems.

Previous research conducted by Yanto et al analyzed the relationship between fruit and vegetable consumption and the incidence of overnutrition among health and non-health workers.[9] In addition, research by Bachtiar et al examined the level of knowledge of vegetables and fruits, spending on vegetable and fruit consumption, and consumption patterns of vegetables and fruits among nutrition and non-nutrition students.[10] Based on the identified problem, this study aimed to examine the relationship between nutritional knowledge, vegetable and fruit consumption behavior and nutritional status of students at Bhayangkara University, Bekasi. The novelty of this study is that there has never been research on the behavior of the implementation of vegetable and fruit consumption.

METHOD

Participants and Study Design

This research was an observational analytic study with a cross-sectional design. A cross-sectional study examines the relationship between exposure and its effects, with data collection carried out at one time. The location of this study was at Bhayangkara University, which is located in Bekasi City, West Java. This study was conducted from March to June 2023. The target population in this study were active students at Bhayangkara University, Bekasi. Students from the Faculty of Communication Sciences were selected as samples.

The sampling of students from the Faculty of Communication Sciences was conducted using the consecutive sampling method, in which participants who met the inclusion criteria were selected until the minimum required sample size was achieved. The inclusion criteria were students aged 19—22 years, classified as young adults, who consented to participate in the study. The exclusion criteria was the absence of students during the data collection period. The minimum sample size, calculated using the proportional difference hypothesis test, was determined to be 61 respondents.

Measurements and Procedure

The independent variables in this study were nutritional knowledge and vegetable and fruit consumption behavior. Nutritional knowledge regarding vegetables and fruits was measured using a questionnaire by Saputro. This questionnaire comprises a total of 19 questions about the health benefits of consuming vegetables and fruits, daily intake recommendations, and ways to prepare healthy vegetables and fruits. The questionnaire was tested for validity and reliability with an r value (for each item) greater than the r table (0.304) and a Cronbach's Alpha value greater than 0.6 (0.873).[11] Vegetable and fruit consumption; behavior was assessed using the Food Frequency Questionnaire (FFQ)

instrument. The dependent variable in this study was nutritional status, determined by calculating the body mass index (BMI).[12]

$$\text{BMI} = \frac{\text{Body Weight (KG)}}{\text{Body Height (m)x Body Height (m)}}$$

Nutritional knowledge regarding vegetables and fruits consisted of two categories: good (score equal to or greater than the median of 73.68) and poor (score less than the median of 73.68). Vegetable and fruit consumption behavior was divided into two categories: sufficient (vegetable consumption equal to or more than 3 times and fruit consumption equal to or more than 2 times per day) and insufficient sufficient (vegetable consumption less than 3 times and/or fruit consumption less than 2 times per day).[12] Nutritional status was categorized into underweight (BMI less than 18.5 kg/m^2), normal (BMI 18.5 to 25.0 kg/m^2), and overweight (BMI greater than 25.0 kg/m^2).[12]

Statistical Analysis and Ethical Clearance

Data underwent editing, coding, entry, and cleaning processes. Statistical software free version was utilized to conduct both univariate and bivariate analyses of the data. Univariate analysis aimed to describe the characteristics of respondents as well as the distribution of the independent variables (nutritional knowledge and vegetable and fruit consumption behavior) and the dependent variable (nutritional status). Moreover, the purpose of the bivariate analysis was to determine the relationship between the independent variables and the dependent variable using the Chi-square test. If the p-value is equal to/less than 0.05, the null hypothesis (H_0) is rejected, thus there is a significant relationship between the independent variables and the dependent variable. On the other hand, if the p-value is greater than 0.05, the null hypothesis (H_0) fails to be rejected, which means there is no relationship between the independent variables and the dependent variable.

This study was approved by the Health Research Ethics Commission of the Muhammadiyah University of Prof. Dr. Hamka University (KEPK-UHAMKA), Jakarta. The study was approved on 15 March 2023, with ethical approval number 03/23.03/02344 after considering the research risks, benefits, participation and confidentiality of respondent information. There are four basic principles in research ethics: respect for subjects, beneficence, non-maleficence, and justice.[13]

RESULT

Table 1 presents the results of the normality test for 61 samples using the Kolmogorov-Smirnov test ($N \geq 50$) on the age variable. The results indicated that the data were not normally distributed (p value<0.05). Therefore, the age variable was described using the median and interquartile range.[14] It is obtained that the median age of students at the Faculty of Communication Sciences of Bhayangkara University, Bekasi, is 20 years old, with an interquartile range variation of 1, which is between 19 and 20 years old. These findings suggest that respondents were relatively homogeneous in terms of their age.

Table 1. Frequency Distribution of Students by Age at the Faculty of Communication Science, Bhayangkara University, Bekasi

Variable	Median	Interquartile Range
Age	20	1 (19—20)

Description of Characteristics, Nutrition Knowledge, Vegetable and Fruit Consumption Behavior, and Nutritional Status

Table 2 shows that of 61 respondents, the majority of students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi, were female (65.6%). Regarding nutritional knowledge, 50.8% respondents were categorized as having good knowledge. An equal percentage, which is 50.8%, demonstrated sufficient vegetable and fruit consumption behavior. Furthermore, the majority of students had a normal nutritional status, with 47.5%.

Table 2. Frequency Distribution of Respondents by Gender, Nutritional Knowledge, Vegetable and Fruit Consumption Behavior, and Nutritional Status of Students of the Faculty of Communication Science, Bhayangkara University, Bekasi

Variable	Frequency (n)	Percentage (%)
Gender		
Female	40	65.6
Male	21	34.4
Nutritional Knowledge		
Good	31	50.8
Poor	30	49.2
Vegetable and Fruit Consumption Behavior		
Sufficient	31	50.8
Insufficient	30	49.2
Nutritional Status		
Underweight	18	29.5
Normal	29	47.5
Overweight	14	23.0

Relationship Between Nutritional Knowledge, Vegetable and Fruit Consumption Behavior, and Nutritional Status

Table 3 shows that students with good nutritional knowledge were more likely to have a normal nutritional status (51.6%). On the other hand, students with poor knowledge also predominantly had a normal nutritional status (43.3%). The Chi-square test yielded a p-value of 0.153 ($p > 0.05$), indicating no significant association between nutritional knowledge and nutritional status.

Table 4 shows that students with sufficient vegetable and fruit consumption behavior were more likely to have a normal nutritional status (64.5%), whereas those with insufficient consumption behavior tended to be overweight (36.7%). The Chi-square test produced a p-value of 0.011 ($p \leq 0.05$), indicating a significant association between vegetable and fruit consumption behavior and nutritional status.

Table 3. Relationship between Nutritional Knowledge and Nutritional Status of Students at the Faculty of Communication Science, Bhayangkara University, Bekasi

Nutritional Knowledge	Nutritional Status						Total		P-value
	Underweight		Normal		Overweight				
	n	%	n	%	n	%	n	%	
Good	11	35.5	16	51.6	4	12.9	31	100.0	0.153
Poor	7	23.3	13	43.3	10	33.3	30	100.0	
Total	18	29.5	29	47.5	14	23.0	61	100.0	

Chi-Square test significant at α level of 0.05 (p-value ≤ α)

Table 4. Relationship between Vegetable and Fruit Consumption Behavior and Nutritional Status of Students at the Faculty of Communication Science, Bhayangkara University, Bekasi

Vegetable and Fruit Consumption Behavior	Nutritional Status						Total		P-value
	Underweight		Normal		Overweight				
	n	%	n	%	n	%	n	%	
Sufficient	8	25.8	20	64.5	3	9.7	31	100.0	0.011*
Insufficient	10	33.3	9	30.0	11	36.7	30	100.0	
Total	18	29.5	29	47.5	14	23.0	61	100.0	

Chi-Square test significant at α level of 0.05 (p-value ≤ α)

DISCUSSION

The total number of respondents in this study was 61 students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi. This study found that the majority of students were female (65.6%). In terms of age, the interquartile range variation was 1, indicating the age of students was between 19 and 20 years old. Hence, they were categorized as young adults. According to the Ministry of Health of the Republic of Indonesia, individuals aged 19—29 years old are classified as young adults.[1]

Univesity students experience a transition to adulthood, which generally occurs in the age range of 18—25 years. In this period, students are responsible for their own development.[15] In early adulthood,

individuals experience a transition from adolescence to adulthood, which is often referred to as the young adult period. In this phase, individuals' cognitive abilities reach a good level; thus, they can adapt to various aspects of life. Moreover, maturity combined with well-developed motor skills enables them to perform tasks and activities more effectively.[16]

This study showed that most students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi, had good knowledge of vegetable and fruit nutrition (50.8%). This finding is higher than that reported by Olatona et al, who found that only 24.9% of respondents in Lagos, Nigeria, demonstrated good knowledge of fruits and vegetables. Their study also revealed that higher education, professional occupations, and higher income levels were significantly associated with good nutritional knowledge.[17]

An individual's level of knowledge is influenced by the frequency of exposure to information, whether through formal education, media, or direct experience.[18] The relatively good nutritional knowledge among students in this study may be attributed to exposure to information from digital media and the internet, which provide accessible resources on the health benefits of vegetables and fruits consumption. Such exposure not only enhances knowledge but may also encourage healthier food choices, as students become more aware of the positive impact of fruits and vegetables on health.[19]

The findings of this study indicate that most students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi, demonstrated sufficient vegetable and fruit consumption behavior (50.8%). In comparison, Olatona et al. reported that only 27.0% of respondents consumed an adequate daily amount of fruits and vegetables (400 grams or 5 portions) every day.[17] Field interviews conducted during the study suggested that students' sufficient consumption behavior was largely influenced by their personal preferences for vegetables and fruits.

According to the Balanced Nutrition Guidelines, the recommended intake is 3—5 portions of vegetables and fruits, equivalent to 250 grams a day, and 2—3 portions of fruits, equivalent to 150 grams a day. Individuals are considered to have 'sufficient' consumption if they consume at least five portions of vegetables or fruits a day.[12] In early adulthood, dietary habits tend to be more favorable, allowing the body to obtain essential nutrients such as vitamins, minerals, and fiber from fruits and vegetables.[20] Conversely, inadequate consumption may result in deficiencies of key nutrients, including vitamin C, vitamin A, potassium, and folate.[21]

The results of this study showed that most students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi, had a normal nutritional status (47.5%). This finding is consistent with the study by Makhrajani et al, which reported that among non-nutrition students, 80.5% had a normal nutritional status, 7.3% were underweight, and 12.2% were overweight.[22]

In general, nutritional status is determined by both nutrient intake and the body's ability to utilize those nutrients effectively. The presence of underweight and overweight students in this study may be attributed to dietary habits, particularly a preference for snacks over staple foods, and a low intake of vegetables and fruits, often due to a dislike of their taste.

Relationship between Nutritional Knowledge and Nutritional Status

The chi-square test produced a p-value of 0.153 ($p > 0.05$), indicating no significant association between nutritional knowledge and nutritional status. In this study, students with good knowledge were more likely to have a normal nutritional status (51.6%). Students with less knowledge have normal nutritional status (43.3%).

These findings are consistent with Wulandari et al., who reported a very weak correlation between nutritional knowledge and nutritional status ($r = 0.124$; $p = 0.319$), suggesting no significant relationship.[23] However, contrasting evidence exists. Florence found a significant association between nutritional knowledge and nutritional status ($\chi^2 = 35.04 > 30.98$), highlighting the possibility that the relationship may vary across populations and contexts.[24]

Interviews and direct observation during this study further revealed that some students with poor nutritional knowledge maintained a normal nutritional status. This is due to the healthy dietary practices developed at home. Conversely, several students with good nutritional knowledge were categorized as underweight or overweight, suggesting that knowledge alone does not always translate into healthy eating behaviors. This underscores the importance of not only improving nutritional knowledge but also fostering consistent application of healthy and diverse dietary habits.

Nutritional knowledge is not a direct determinant of an individual's nutritional status, as it is also influenced by other factors such as dietary intake, infectious diseases, and environmental conditions. Nevertheless, nutritional knowledge plays an important role in shaping attitude and behavior related to food choices and in fostering an understanding of the benefits of various nutrients.[25] The extent to which individuals translate knowledge into healthy eating practices ultimately affects their nutritional status.[26] In this study, the findings indicate that nutritional knowledge did not have a significant effect on the nutritional status of students at Bhayangkara University, Bekasi.

Relationship between Vegetable and Fruit Consumption Behavior and Nutritional Status

The chi-square test yielded a p-value of 0.011 ($p \leq 0.05$), indicating a significant association between vegetable and fruit consumption behavior and nutritional status among students at Bhayangkara University, Bekasi. The findings further showed that students with insufficient consumption of vegetables and fruits were more likely to be overweight (36.7%).

These results are consistent with Yanto and Verawati, who reported a significant association between fruit consumption and overweight status ($p = 0.021$). Their study also found that individuals with inadequate fruit intake had a 3.28 times greater risk of being overweight (POR = 3.281).[9]

Eating behavior encompasses actions related to food consumption, including the type, quantity, and timing of meals, all of which directly influence health and nutritional status.[27] Vegetables and fruits are essential components of a healthy diet, as they are rich in water, minerals, vitamins and dietary fiber, yet low in carbohydrates and fat. Dietary Fiber, in particular, plays a significant role in reducing plasma lipids, lowering glycemic response, and regulating body weight.[28] These findings emphasize the importance of adequate vegetable and fruit consumption in maintaining a healthy nutritional status among students.

Interviews and direct observations revealed that respondents with insufficient vegetable and fruit consumption behavior often presented an overweight status. This condition was partly due to a lack of preference for consuming vegetables and fruits, or a tendency to consume them only in processed forms, such as stir-fried vegetables, *pecel*, and juice. Conversely, respondents with an underweight status were generally those who disliked vegetables and fruits or preferred unprocessed forms, such as whole raw fruits and vegetables. Adequate consumption of vegetables and fruits is essential for maintaining health. They are rich in water, minerals, vitamins and dietary fiber, while being low in carbohydrates and fat. The fiber contained in fruits and vegetables can lower plasma lipids, reduce glycemic response, and regulate body weight.[28]

Insufficient intake of vegetables and fruits increases the risk of being overweight, as dietary fiber helps promote satiety by absorbing water and expanding stomach volume, thereby slowing digestion and prolonging the feeling of fullness.[29] Moreover, the addition of high-energy ingredients—such as sugar, oil, and peanuts—when processing vegetables and fruits can increase the risk of overnutrition, as these ingredients are high in calories and fat. Therefore, regular consumption of vegetables and fruits in their healthier forms is vital for achieving and maintaining an optimal nutritional status, as they provide essential nutrients that support overall health.

CONCLUSION

The respondents' average age was between 19 and 20 years old, and the majority were female (65.6%). Most students of the Faculty of Communication Sciences at Bhayangkara University, Bekasi, demonstrated good knowledge of vegetable and fruit nutrition (50.8%). Similarly, vegetable and fruit consumption behavior was predominantly categorized as sufficient (50.8%). Statistical analysis revealed no significant association between nutritional knowledge and nutritional status ($p = 0.153$; $p > 0.05$). However, a significant relationship was found between vegetable and fruit consumption behavior and nutritional status ($p = 0.011$; $p \leq 0.05$).

Students are encouraged to maintain their current level of nutritional knowledge and for those with lower levels, to make improvements. Importantly, good nutritional knowledge should be consistently applied in daily life. Students are also expected to sustain sufficient vegetable and fruit consumption behavior while further improving behaviors that remain insufficient, in line with balanced nutrition guidelines, to support optimal nutritional status.

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